

REMARKS

Applicants respectfully request consideration and allowance of claims 97-100, 102-112 and 129-134 that are pending in the above-identified patent application. Applicants have amended claim 97 and canceled claim 101. No new matter has been added by the claim amendments.

Claim Objection

In numbered part 3 of the Office Action, the Examiner objected to claim 97, alleging that it must set forth the order of the materials from "top to bottom or bottom to top" and specify whether the materials are layered or sheets. In response, Applicants have amended claim 97 to recite that the claimed semiconductor-on-insulator is a "layered structure." Applicants note that the preamble of claim 97 as filed recites that "at least a part of the structure comprises in order: . . ." Applicants submit that the above sets forth the claimed structure with sufficient particularity. Thus, withdrawal of the objection is respectfully requested.

Rejection under 35 U.S.C. § 102(e)

In numbered parts 4-5 of the Office Action, the Examiner rejected claims 97, 98, 108, 110, 112, 129 and (133) under 35 U.S.C. § 102(e) as being anticipated by U.S. 6,610,582 ("the '582 reference"). Although Applicants do not agree that the '582 reference anticipates independent claim 97 of the instant application, such claim has been amended to recite the limitations of claim 101 (now cancelled). Claim 97 now requires that "the surface of material S farthest from material G is an exfoliation surface." Applicants submit that the '582 reference fails to disclose or suggest the above feature.

Accordingly, withdrawal of the rejection under § 102(e) of claims 97 and the claims dependent thereon is respectfully requested.

Rejections under 35 U.S.C. § 103(a)

In numbered parts 6-14 of the Office Action, the Examiner rejected a number of claims depending from independent claim 97 under 35 U.S.C. § 103(a) as being obvious in view of the '582 reference alone or in combination with one or more of a number of other references. As applicants have amended claim 97 to include the limitations of dependent claim 101, Applicants will focus attention on numbered part 13 of the Office Action, where the Examiner has cited the combined teachings of the '582 reference and U.S. 6,048,411 ("the '411 reference") against claim 101.

Although the Examiner admits that the '582 patent fails to disclose that "the surface of material S farthest from material G is an exfoliation surface," he alleges that the '411 reference discloses the cleaving of a semiconductor material from a bonded structure. The Examiner cites the abstract of the '411 patent as providing motivation for using an exfoliated surface as an alternative to epitaxial silicon growth – and that it would therefore be obvious to combine the teachings of the '411 reference and the '582 reference. Upon close scrutiny, however, the Examiner's rationale in combining these teachings is flawed and the § 103(a) rejection cannot stand under the applicable rules.

To establish a *prima facie* case of obviousness, three basic criteria must be met:

- (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
- (2) there must be a reasonable expectation of success; and
- (3) the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

As will be discussed below in detail, Applicants submit that none of the three criteria exist here.

As to the first criteria, there is no motivation found in either reference to combine the teachings of the '411 reference and the '582 reference. The Examiner cites the Abstract of the

'411 patent as providing motivation for using an exfoliated surface as an alternative to epitaxial silicon. No such motivation is found in the Abstract of the '411 patent, which states:

A hybrid silicon-on-silicon substrate. A thin film (2101) of single-crystal silicon is bonded to a target wafer (46). A high-quality bond is formed between the thin film and the target wafer during a high-temperature annealing process. It is believed that the high-temperature annealing process forms covalent bonds between the layers at the interface (2305). The resulting hybrid wafer is suitable for use in integrated circuit manufacturing processes, similar to wafers with an epitaxial layer.

At best, the above-quoted Abstract of the '411 patent provides motivation to employ a "high-temperature annealing process" to form "covalent bonds" between two silicon wafers, which bonds are suitable to stand up to integrated circuit manufacturing processes, similar to wafers with an epitaxial layer. It is thus the bond discussed in the Abstract of the '411 patent that is the key point, not exfoliation – which is not mentioned there at all. The question of whether the annealing bond process of the '411 patent may be used instead of an epitaxial silicon growth process would appear to have little relevance as concerns the '582 reference, particularly since neither the section of the '582 reference cited by the Examiner in part 3 of the Office Action (Col. 1, lines 30-43), nor any other portion of the '582 reference mentions epitaxial growth of semiconductor materials on glass.

Further, the '411 patent is specifically directed to "a technique for manufacturing a silicon-on-silicon substrate assembly." (Col. 1, lines 21-24, emphasis added.) The silicon-on-silicon process of the '411 patent is described at column 6, line 44 through column 7, line 2 as follows:

A process for fabricating a silicon-on-silicon substrate according to the present invention may be briefly outlined as follows:

- (1) Provide a donor silicon wafer with a highly polished surface;
- (2) Introduce particles into the silicon wafer through the highly polished surface to a selected depth to define a thickness of silicon film;
- (3) Provide a target substrate material with a highly polished surface;
- (4) Prepare the surface of the donor wafer and/or the surface of the target wafer for beta bonding the donor wafer to the target wafer (optional);
- (5) Beta bond the donor silicon wafer to the target substrate material by joining the two highly polished surfaces;

- (6) Separate a thin film of material from the donor substrate, the thin film of material adhering to the target substrate;
- (7) Anneal the hybrid substrate of the thin film and the target substrate to complete bonding of the two layers together;
- (8) Polish a surface of the thickness of silicon film (optional).

In contrast, the section of the '582 patent cited by the Examiner in part 3 of the Office Action (Col. 1, lines 30-43) is directed to a silicon-on-glass bonding process. There is no motivation provided in either of the cited references to employ a silicon-on-silicon exfoliation process of the '582 patent with the silicon-on-glass bonding process disclosed of the '411 patent. It appears, therefore, that the Examiner is either relying upon personal knowledge in supplying the above-stated motivation, or the Examiner is relying on the motivation to combine silicon layer exfoliation with a silicon-on-glass bonding process found solely in Applicants' disclosure. If the Examiner is relying on the former, then Applicants respectfully request that the Examiner provide an affidavit or declaration setting forth specific factual statements and an explanation to support his position in accordance with M.P.E.P. § 2144.04(C). As to the latter, Applicants contend that the motivation to combine silicon layer exfoliation with a silicon-on-glass bonding process is found only in Applicants' disclosure and, therefore, it would be error for the Examiner to rely on same; indeed, such is improper hindsight reconstruction. M.P.E.P. § 2145 (X)(A).

As to the second criteria, that there must be a reasonable expectation of success, Applicants submit that one skilled in the art would not have a reasonable basis to conclude that an exfoliation process may be used in a silicon-on-glass bonding process when looking to the teachings of the '582 patent and the '411 patent. Indeed, the '411 patent only provides reasonable expectations of success when consideration of silicon-on-silicon annealing bonds are employed – no such reasonable expectation carries over to anodic bonding of silicon-on-glass. That, however, is the subject of Applicants disclosure – which should not be used by the Examiner against Applicants.

As to the third criteria, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Here, if the teachings of the '582 patent and the '411 patent were combined, the resulting structure would be a silicon-on-silicon structure having an

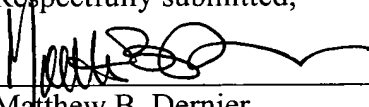
exfoliated surface on one of the silicon wafers. As the teachings of these reference simply do not lead one skilled in the art to the claimed structure, the third criteria is not met.

Based on the foregoing, Applicants assert that none of the three criteria supporting a prima facie case of obviousness is met under M.P.E.P. § 2143. Accordingly, Applicants submit that independent claim 97 as amended is patentable over the cited references. Further, the other dependent claims rejected by the Examiner over the combination of the '582 reference alone or with other references are believed patentable in light of the showing above.

Conclusion

Applicants respectfully request early and favorable action in view of the above remarks and amendments. It is not believed that any fees are due. In the event there are any fees due and owing in connection with this matter, please charge same to our Deposit Account No. 11-0223.

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